CHAPTER 9

THE GOVERNANCE OF DIRECTOR NETWORKS

LUC RENNEBOOG AND YANG ZHAO

Introduction

Social and professional networks govern our lives; they are established through common education, sports interests, club memberships, as well as connections resulting from professional lives. The economics and finance literature has begun to give more attention to the influence of managers' and non-executive directors' connections on corporate decision-making and corporate monitoring. Indeed, it may be that professional networks have a bigger impact on corporate policy than we anticipate, and even influence the effectiveness of institutionalized governance structures (such as boards of directors) or the role of governance regulation.

Director networks, also known as director interlocks, are networks formed by executive and non-executive directors sitting on corporate boards. Links within director networks are established when two directors are sitting on the same board. Research on director networks emerged at the beginning of the 20th century, when director networks were considered a tool to foster corporate collusion. The following quote was from Louis Brandeis as the associate justice of the US Supreme Court. He made this statement before the passing of the Clayton Act (1913: 51), which prohibited extensive director networks as these could lead to collusion in concentrated industries. The quote appeared in the US House of Representatives Staff Report to the Antitrust Committee (1965: 3).

> The practice of interlocking directorates is the root of many evils. It offends laws human and divine… Applied to corporations which deal with each other it tends to disloyalty and to violation of the fundamental law that no man can serve two masters. In either event it tends to inefficiency; for it removes incentive and destroys soundness of judgment. It is undemocratic for it rejects the platform: "A fair field and no favors" (Brandeis, 1913)

In recent years, the number of directorships held by one individual has been capped in some countries.[1] However, within these legal boundaries, the power of director networks can still be significant. In the developed countries, director networks are important among large corporations: one-fifth of the 1,000 largest companies in the US share at least one board member with another of the top 1,000. More than 1,000 board members sit on four or more corporate boards, and 235 sit on more than six (~~Matt~~ Krantz, 2002). The four largest oil companies have interlocking directorates with the international mega-banks. Exxon Mobil shares board members with JP Morgan Chase, Citigroup, Deutsche Bank, Royal Bank of Canada, and Prudential. Chevron Texaco has interlocks with Bank of America and JP Morgan Chase. BP Amoco shares directors with JP Morgan Chase. RD/Shell has ties with Citigroup, JP Morgan Chase, N. M. Rothschild & Sons, and the Bank of England (Henderson, 2010). As regulations on director networks differ across countries, these cross-border director networks between powerful international corporations are not tightly regulated. Lastly, besides the professional connections, directors may also be connected by education, membership of social clubs, etc. Such informal director networks seem to gain in importance.

In this chapter, we review the history and current status and regulation of director networks in some major western countries in the next section. The academic literature on director networks is then summarized. Different approaches to analyzing director networks are discussed and compared in the following section. The final section concludes.

Director Networks in History and Today

Networks in the US

The earliest director network documented can be found in the incorporation documents of New England textile mills in the US in 1790. A small group of wealthy businessmen became owners of each other's companies and could thus be called an ownership network. In 1845 a larger group of 80 people, known as the "Boston Associates," controlled 20 percent of the textile industry. Seventeen of these men served as directors in Boston banks, 20 were directors in six insurance companies, and 11 were directors of five railroad companies (Dalzell, 1987). During the mid and late 19th century, director networks, usually led by families and large owners, became widespread in the major industries in the US. Banks and other financial institutes were at the center of this powerful director network. This situation finally led to the adoption of the Clayton Act in 1914.

Section 8 of the Clayton Act is specifically designed to restrict director interlocks. At the beginning, director interlocks were defined as two competing corporations sharing one or more common directors. In the meantime, the act has been amended six times since its enactment. Today, Section 8 prohibits, with certain exceptions, any person from serving as a director or officer in two competing corporations. In Section 8, competitor

corporations are defined as firms with capital, surplus, and undivided profits aggregating to more than $10,000,000, with the exception that no corporation is covered if the competitive sales of either corporation are less than $1,000,000. Section 8 does not affect companies in the banking sector. Interlocking in the banking sector is governed by Federal Deposit Insurance Corporation (FDIC), under "Part 348, Management official interlocks," which has even more stringent rules regarding director interlocks.

With Section 8 of the Clayton Act outlawing a large part of director connections, director networks became much weaker in competitive firms and the banking sector. As a consequence of the separation of ownership and control, the networks between companies in the early 1900s had become less dominated by families and bankers. Instead, professional managers became gradually more interlocked, a trend which continued until the late 1900s. The majority of networked directors are professional, white, male managers. Only recently, since the end of the 20th century, the diversification of director networks has increased, with more women and people of color joining corporate boards. Although more restrictions have been put on boards, many firms still have large networks. For instance, in 2005, Citigroup had 25 links to other companies through shared directors. Most of these firms were the biggest in their sectors, such as AT&T, Ford Motors, PepsiCo, Time Warner, and Xerox (Domhoff, 2006). It is not surprising to hear the claim that the American economy is controlled by a small group of corporate elites from these large and connected companies.

Since the financial crisis of 2007–8, the Securities and Exchange Commission (SEC) is planning to enforce a new code on good corporate governance to further discourage multiple directorships, because serving on too many boards decreases the time and energy one can invest in any individual company.

Networks in the UK

The situation in the UK bears many similarities as financial companies are also the most connected companies in the economy. But due to differences in regulation and culture, the development and structure of director networks differs from the American situation.

The first research documenting the UK director networks is Beesley (1951). He traced down the director networks existing between all companies in British Midland metal industries. He found that in 1948 connections had been forged between the largest companies, which employed one-third of the industry's workers. Beesley considered this director network a protective device to ensure that individual investment decisions would not be harmful to other group members. The coordination mechanism was, according to Beesley, harmful since it delayed investment in research and development. In recent years, director networks in the UK have been more "concise" compared to the US case. Directors usually do not have more than two connections with other boards. The connections between companies are often maintained by one common director (Santella et al., 2008). Nevertheless, Renneboog and Zhao (2011) still find some network

superstars in their UK sample: Andy Hornby was sitting on four boards, while being the CEO in one of these firms in 2006. Peter Cawdron was a non-executive director or chairman in nine companies. Another feature of the British director networks is that there are connections between financial institutions through common directors, since this is not prohibited by the UK regulation

The UK Corporate Governance Code (known as the Combined Code up to 2010) is a set of rules provided by the Financial Reporting Council (FRC) as a guide to good board practice (Higgs Report, 2003). Section A proposes guidelines for the appointment of independent directors. In order to judge whether a non-executive director is independent, several criteria are provided. A director is not independent if he "holds cross-directorships or has significant links with other directors through involvement in other companies or bodies" (A.3.1). As for executive directors, A.4.5 states: "The board should not agree to a full time executive director taking on more than one non-executive directorship in a FTSE 100 company nor the chairmanship of such a company" (Higgs Report, 2003). A.3.1 and A.4.5 strongly discourage multiple directorships but are not binding: should the company insist on allowing multiple directorships, a clear explanation is to be given to the regulation authority as well as the investors.

From these elements of the regulation and codes of best practices in the US and the UK, it is clear that the regulatory authorities consider director networks potentially harmful to corporate competition, to the independence of non-executive directors, and the efficiency and responsibility of executive directors.

Networks in Other Developed Countries

Besides the US and the UK, director networks are popular in other countries too. Since the 1970s, director networks in Germany have come under pressure from the financial press. According to Prinz (2006), an overwhelming majority of the listed companies are connected by directors and/or financial ties. He claims that influential director networks diminish the motivation to compete and restructure. Similar to the US and the UK, the German regulator also imposes limitations on director networks. German business legislation (100, 105 AktG, since 1965) limits the number of supervisory board mandates to a maximum of ten seats per person, whereas a position as president of the supervisory board is given double weight. Moreover, mutual exchange-directorships are forbidden. These rules effectively limit the growth of director networks in Germany. Nonetheless, Heinze (2002) shows that, although over time there has been a quantitative reduction in director networks, the qualitative structure remained stable over the period of 1989 to 2001.

Director networks in France are different from most other countries as they are determined by the educational and political backgrounds of the directors. First, directors are drawn from a limited set of *Grandes Ecoles*, which have powerful alumni networks. Second, a large proportion of the business elites are former civil servants, who have built connections through political relations. These two networks are of overwhelming

importance in the French business world. ENA (*Ecole Nationale d'Administration*) and graduates of the *Ecoles Polytechniques* run more than 20 percent of the listed firms, which accounts for around 70 percent of all assets traded on the Paris Stock Exchange. Twenty percent of the firms are run by former high-ranking bureaucrats (Kramarz and Thesmar, 2006). To sum up, director networks in France are based on education and past civil service, rather than mere professional ties.

Director networks in Italy and Spain are strong too. Compared to the US, the UK, and Germany, director networks in the southern European countries show a high network density. In an Italian sample of 40 blue-chips in the S&P-MIB (Standard & Poor's/Milano Italia Borsa) 40 index, 31 companies are connected and one out of ten directors is sitting on two or more boards (Santella et al., 2008). The ratio is similar for Spain (Crespi and Pascual-Fuster, 2008). On average, a Spanish director serves on 1.22 boards; some directors even sit on five boards simultaneously.

To conclude, director networks have a long history and remain influential in most developed countries today. The potential harm of director networks is recognized by the regulatory authorities. Several restrictions have been imposed to deter excess director networks. However, over time director networks evolve and adapt to the new regulatory environment and retain their influence in the corporate world. In the next section, we review the academic literature on director networks in order to obtain more insights about the motivation, mechanism, and impact of director networks.

Research on Director Networks

Director Networks and Collusion

Concerns about director networks have attracted public and academic attention in Germany (Jeidels, 1905) and the US since the early 1900s. Toward the end of 19th century, the growth and concentration of some industries, for instance iron and steel production and railroads, induced stronger corporate connections through interlocking directorates. In the US the debate even triggered a government investigation and led to the Clayton Act in 1914, which eventually prohibited interlocking directorates in the railroad industry, competing firms, and banks. Research on this period usually concentrates on the interlocks of a few large companies in the economy, ignoring the networks between other companies (see e.g. Dooley, 1969). As it is often argued that interlocks are a product of the development of monopolistic structures, studies on interlocks are embedded in antitrust research. In the mid-20th century, antitrust research also included investigations of the types of interlocked directors, company types, and whether interlocks are related to geography and industry factors (Mizruchi, 1982). The pioneering studies in Germany and the US were soon mimicked for the UK (Aaronovitch, 1961) and the Netherlands (Baruch, 1962). Aaronovitch (1961) describes the networks among British companies as an instrument used by

capitalists to control the industry. Baruch (1962) documents that director networks in the four large Dutch banks also played a crucial role in fortifying control over a large range of related companies. Although the intensity of interlocking was lower in these countries in the early 20th century, they share many features with the German and American markets, such as the high interlocking level in the finance industry. In a comparative study covering the first half of the 19th century, Fennema and Schijf (1978) report that the number of interlocks declined in the US but increased in most other countries. The most plausible explanation for this is the introduction of legal restrictions in the US.

Although regulation has tried to reduce the potential collusion of director networks, research has shown that director networks may also yield political influence. A pioneering study on director networks and firms' political action is that by Koenig (1979), who found that connected companies contribute more to election campaigns. Studies by Mizruchi and Koenig (1986) confirm this finding, but also report that interlocks via financial institutions can be used to predict the political positions of companies. They argue that companies interlocked through indirect ties can better coordinate with each other and are hence more likely to express similar positions in congressional hearings. This is contradicted by Burris (1987). As it is likely that companies can benefit from director networks involving politicians, Agrawal and Knoeber (2001) document that politically experienced directors are more prevalent in companies where the costs of environmental regulation, sales to government, and exports are greater, and lobbying is more important.

Motivations to Create Director Networks

Mizruchi (1996) presents a comprehensive review of the director network studies from the 1970s to the 1990s. In his paper, four motivations for the establishment of networks are developed: (i) collusion, (ii) monitoring, (iii) legitimacy, and (iv) career advancement. While the collusion argument has been discussed above, the monitoring argument is that interlocks are created to better monitor the management. Westphal and Zajac (1996) state that (the lack of) interlocks result(s) from the power struggle between the CEO and the board. They find that powerful CEOs select and retain passive board members in order to maintain control. In contrast powerful boards prefer new board candidates with monitoring experience. Furthermore, better monitoring is supposed to lead to better corporate performance. Burt (1983) confirms this expected positive relation between profitability and interlocks, but Dooley (1969) and Lang and Lockhart (1990) draw opposite conclusions. In addition to the ambiguous results on the relation between interlocks and performance, another unresolved issue in these papers is causality. In other words, is it profitability that triggers interlocks, or the other way around? Richardson's (1987) research provides some answers to the causality question: his interviews with bankers confirm that bankers often join boards of companies

in financial difficulties. The legitimacy argument is that recruiting reputable directors onto the board earns the trust of investors and financial institutions (Scott, 1992). Most studies prior to the late 1990s have overlooked directors' individual incentives to initiate connections. Career advancement is one of the most prominent of individual motivations to participate in director networks. On this topic, the pioneering studies by Stokman et al. (1988) and Zajac (1988) show that directors join other boards for reasons of prestige and extra compensation. A recent empirical test by Kirchmaier and Kollo (2007) confirms the role of several individual factors, such as prestige, title, and education, which contribute to the expansion of director networks.

A motivation for the creation of director networks is their information value. More explicitly, director networks can transfer valuable information, knowledge, skills, and experience between companies. Davis et al. (2003) study the composition of the small world of American corporate elite for the period 1982–2001 and find that board members who have been involved in crucial board decisions, for example mergers and acquisitions (M&As) and business alliances, are more likely to be invited by other companies to serve as non-executive board members. This implies that director networks function as channels for gathering information for corporate decision-making. Myint et al. (2005) present a case from the Cambridge hi-tech cluster and show that valuable multiple directorships create new business opportunities and transfer management expertise. Another case study, conducted by Shaw and Alexander (2006), documents the knowledge transfer of supermarket retail techniques from North America to Britain. During the 1950s British supermarket retailers faced difficulties in adopting American methods of self-service selling. Some of the British supermarket retailers (e.g. Tesco and Sainsbury) solved this problem by direct observation of the US market, but others (such as Melias) transferred the knowledge via shared directors after having gained control of an American supermarket retailer. These cases provide textbook examples of how director networks can acquire knowledge and management experience to aid companies entering a new business (model).

Director Networks and Corporate Governance

We can categorize the literature on this topic into several strands: (i) M&A strategies, (ii) financing opportunities, (iii) managerial compensation, (iv) managerial succession, and (v) corporate performance.

The first strand of the literature is on interlocks and M&A strategies. Interlocked firms are more likely to adopt similar strategies, such as takeover defenses (Davis 1991) and friendly acquisitions (Palmer et al., 1995). D'Aveni and Kesner (1993) find that takeover resistance is more likely to be weaker if top managers from the bidder and target are connected. Haunschild (1993) studies 327 US firms in four industries and shows that

firms are more likely to engage in acquisitions if they are connected with other firms that have recently made acquisitions. Lastly, on the issue of the probability of being the target in a takeover, Davis and Stout (1992) believe there is no association between the presence of a banker on the board and the likelihood of the firm being a target, whereas Fligstein and Markowitz (1993) find a positive correlation. The latter study also shows that bankers are often appointed to boards of firms experiencing financial difficulties, which are likely to become takeover targets.

The second strand comprises financing opportunities for which interlocks between firms and banks are of importance. Ratcliff (1980) finds that the interlocks of a bank are positively associated with corporate lending, but negatively associated with mortgage lending. Stearns and Mizruchi (1993a, 1993b) document a positive association between the presence of a banker on a firm's board and the additional financing this firm attracts from that specific bank. Still, the study also suffers from the typical causality problem. On the one hand, a banker's presence in a firm may facilitate borrowing, but on the other hand, a firm with high leverage may invite a banker to its board.

In line with agency or tournament theories, director networks can be regarded as a tool for top managers to extend their power over the board in order to extract private benefits. Interlocks can also be indicators of busy boards (lacking time to monitor the firm) and hence ineffective corporate governance. In the remainder of this section, we review the director network studies on managerial compensation, managerial turnover, and firm performance.

Cochran et al. (1985) find that the proportion of outside directors is positively associated with the top manager's chance of receiving excessive severance pay, which is confirmed by Singh and Harianto (1989), Wade et al. (1990), and Davis (1994). A likely explanation for this seemingly paradoxical finding is that the CEO appoints friends as outside directors in order to have little resistance to (controversial) corporate policies. Several studies following the seminal paper by Hallock (1997) find a positive correlation between board interlocks and CEO compensation. Recent papers based on better measurement of director networks confirm that a CEO's compensation increases with his centrality level in his network (Barnea and Guedj, 2009). The explanation for this finding is that the CEO's personal influence can be enhanced by the power derived from the network. Furthermore, non-executive directors serving on a board with a powerful CEO may be more lenient in the CEO's remuneration contract design. Moreover, if a company has too many non-executive directors with outside directorships, this busy board may not be able to spend sufficient time on the firm's policies (including the remuneration policy). Both effects can result in a suboptimal remuneration scheme that overpays the CEO or does not link pay to performance. Such a relationship between directors' level of connectedness and their payment is also found by Kuhnen (2006), and Devos et al. (2006). An alternative explanation for the relation between CEO connectedness and pay is offered by Engelberg et al. (2009), who argue that companies pay their CEO for the connections. By counting the past connections, and the educational and social connections of the CEO, Engelberg et al.

(2009) find that one additional connection to the CEO increases his total pay by up to 10 percent.

Concerning the issue of managerial turnover and succession, Fich and Shivdasani (2006) and Barnea and Guedj (2009) have analyzed the turnover decision of the CEO: better connected CEOs are less likely to be dismissed when performance of the company goes down. Not surprisingly, the turnover-performance sensitivity declines when the board is occupied by directors with many outside directorships. Moreover, evidence of the importance of weak ties (Granovetter, 1973) is also found in the top managerial labor market. Liu (2008) demonstrates that better connected candidates are more likely to be chosen as the new CEO (especially when they are external candidates).

How do director networks affect corporate performance? The early studies, conducted by Carrington (1981), Meeusen and Cuyvers (1985), and Baysinger and Butler (1985), claim that there is either no correlation between interlocks and profitability or a negative one. In the recent literature, Carpenter and Westphal (2001) find that strategically related interlocks improve board involvement when firms are in a stable business environment. When this environment is unstable, strategically heterogeneous links are proven to be more effective. Ong et al. (2003), Myint et al. (2005), Hochberg et al. (2007), and Gutierrez and Pombo (2010) show evidence that multiple directorships improve the performance of the company. Meanwhile Kiel and Nicholson (2006) find no evidence of a relationship between financial performance and director connections. Recently, more studies show evidence of an adverse impact of director networks on performance, for example Core et al. (1999), Fich and White (2003), Larcker et al. (2006), Kuhnen (2006), Santos et al. (2009), Kirchmaier and Stathopoulos (2008), and Subrahmanyam (2008). Some other researchers point to the relation between interlocks and poor corporate governance. For instance, poor investor protection and lack of transparency contribute to synchronicity in returns data. In academic research, stock price synchronicity is often used as a measure of corporate governance efficiency. Khanna and Thomas (2009) find a significantly positive relation between the degree of firm interlocks and stock price synchronicity, which suggests that director networks between firms may harm corporate governance.

In general, there is much more past and current evidence on the detrimental effects of director networks on performance. However, one needs to be aware of the common drawbacks in this literature. First, the causality and endogeneity issues mentioned above remain an issue even in many recent studies. For instance, in studies on the relation between performance and director networks, it is important to realize that the positive correlation between connections and performance may not result from interlocks improving performance but from connections being a proxy for past good performance. Second, selection biases are prominent in director network research. Some studies focus on the largest companies only or on an industry, which may reduce the integrity of the key network measures used in these papers. Third, many (especially early) studies do not appropriately control for factors (such as CEO, board, firm, and industry characteristics) that may influence the dependent variable, hampering the accuracy and generalizability of the results.

Analyzing Director Networks

Network Measures

Director networks can be measured or proxied in the following ways:

- The existence of (external) connections

The basic method to quantify director networks consists of the use of dummy variables that identify whether directors are sitting on more than one board (they are then tagged as "connected"). The limitations of the dummy variable approach are obvious. A director with multiple connections (sitting on more than two boards) is treated in the same way as a director with only one connection. Hence, the dummy variable approach fails to capture the impact of directors with large networks. Nor does it capture the location of a director in the overall network, which is important for network functions such as information gathering.

- The basic centrality measure: degree or the number of connections

Degree stands for the number of directors connected to a specific director. By counting the number of connections, the level of connectedness of directors with multiple board positions can be compared. Variations on this theme consist of using the number of external board positions (external director connections). This simple approach has been widely used in academic research as an indicator of a manager's network influence. However, it does not capture the positional advantage in the director networks, which makes the number of connections an inferior measure for studying the information collection efficiency.

- Other centrality measures

Developed within graph theory, centrality measures consist of the numbers and ratios that reflect the network properties of a vertex in a graph. Centrality measures have been widely used in computer science, biology, and sociology studies, where network properties can affect individuals' behavior. Centrality measures such as betweenness and closeness show how central a director is within the whole network, which makes them excellent measures of information collection efficiency. An example of how to calculate centrality measures can be found in the following sections.

Graph Theory in Practice

Figure 9.1 depicts the director network surrounding Andy Hornby, the CEO of HBOS plc, a banking and insurance company. In 2006, Andy Hornby was also a non-executive director in the life assurance and unit trust company St. James's Place plc, and in the

retail companies GUS plc and Home Retail Group plc. This example is a fragment of a complete director network where a director is denoted by a *vertex* (or node). A connection between two vertices is called a *link* (or edge, tie). The system of these vertices and links is a *graph* (or map). As links between two vertices are established when two directors are sitting on the same board, Andy Hornby's four directorships create connections with 38 directors. Besides Andy Hornby, HBOS and St. James's Place shared another two directors: Jo Dawson and James Crosby. Jo Dawson was an executive director in HBOS and a non-executive director in St. James's Place. James Crosby was the CEO of HBOS before Andy Hornby. Similarly, GUS and Home Retail Group shared three directors, Oliver Stocken, John Coombe, and Terry Duddy. Oliver Stocken was a non-executive director in GUS and chairman of the board in Home Retail Group. John Coombe was a non-executive director of GUS and a senior non-executive director of Home Retail Group. Terry was an executive director of GUS and the CEO in Home Retail Group.

A sequence between two vertices, visiting no vertices more than once, is called a path. In Figure 9.1, there exist multiple paths between John Peace and Richard Ashton. For example: Peace—Duddy—Ashton, Peace—Stocken—Ashton, Peace—Coombe—

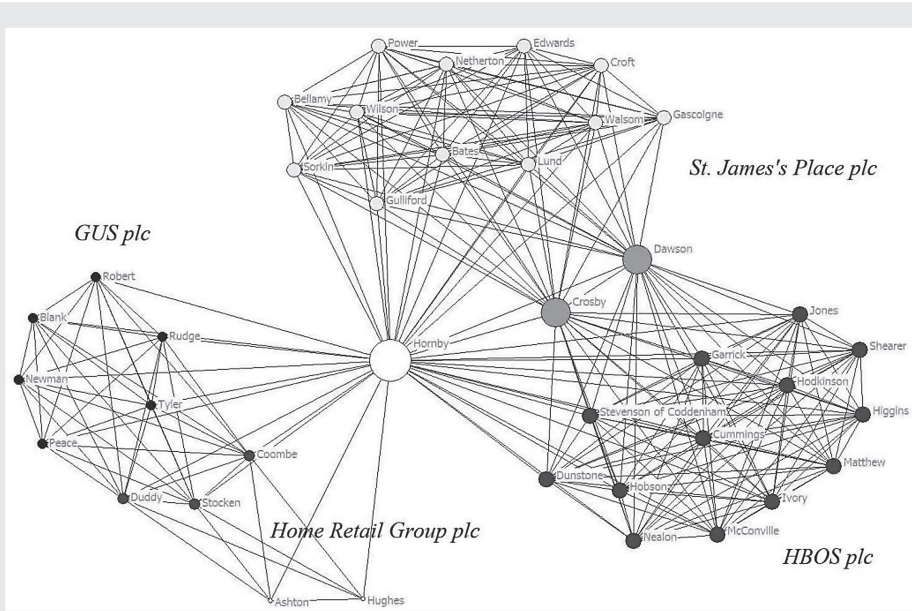

FIGURE 9.1. Example of a CEO's professional network

Notes: This figure depicts the director networks surrounding Andy Hornby (white circle in the middle of the graph), who serves in four companies, including St. James's Place (upper), HBOS (right), Home Retail Group (bottom), and GUS (left). Directors in these four companies are represented as circles (vertices) around Andy Hornby. Directors in the same company are clustered together. Directors sitting on the same board established links between them. In this figure, the lines between circles represent the links between directors. The size of a circle is proportional to the number of links it has.

Source: Renneboog and Zhao (2011).

Hughes—Ashton and etc. The length of a path is the number of links it comprises and a *geodesic path* is the shortest path between two vertices (which is not necessarily unique). In the above example, both Peace—Duddy—Ashton and Peace—Stocken—Ashton are both geodesic paths between Peace and Ashton.

A CEO's network grows stronger when he accepts more external directorships. Reciprocal interlocks (the mutual exchange of directors) also occur more frequently. Such a network can be used to extend CEO power which could enable the CEO to influence board decision-making (possibly to his own benefit). The connections built for the purpose of accumulating managerial influence are referred to as *managerial influence*-oriented connections. Networks not only increase a director's influence but also bring additional skills, knowledge, and information to the company, which may lead to corporate governance and performance improvements. Connections maintained for the sake of information collection are referred to as *information value*-oriented connections. Centrality measures that capture the level of connectedness in the local region based on adjacent connections are called the *direct centrality measures* (degree, eigenvector centrality). They are used to measure managerial influence-oriented connections. Centrality measures that analyze the position of a director in the entire network based on distances between target director and other directors are called *indirect centrality measures* (e.g. closeness and betweenness). They are used to evaluate information value-oriented networks. In order to explain various centrality measures, we construct a hypothetical network (Figure 9.2) with six companies and ten directors. In Table 9.1, the numbers refer to firms and letters stand for directors (Table 9.1, Panel A).

The *degree* centrality of a vertex is calculated as the number of links held by that vertex. In the above example, the number of links for director *a* is 6, so director *a* has degree centrality of 6. This can also be seen from Panel A of Table 9.1, director *a* is connected to two

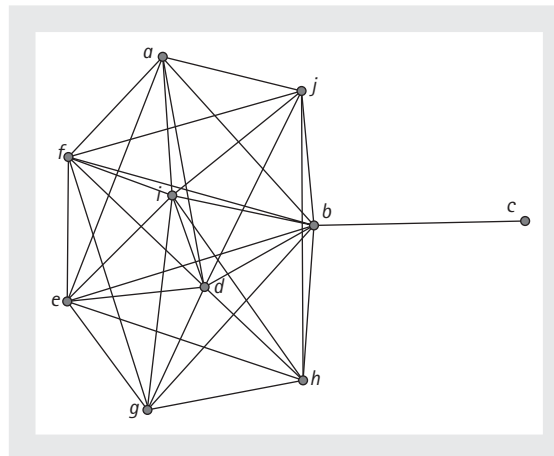

FIGURE 9.2. A director network graph

Note: This figure is a hypothetical director network graph used for centrality illustration.

Table 9.1. An example of a director network

Panel A: Example of a network

Company	Director	Company	Director
1	*a*	5	*a*
		5	*b*
2	*b*	5	*j*
2	*c*	5	*f*
		5	*d*
3	*a*		
3	*e*	6	*b*
3	*f*	6	*g*
		6	*d*
4	*h*	6	*e*
4	*d*	6	*h*
4	*i*	6	*i*
4	*j*		

Panel B: Centrality measures

	Degree	Closeness	Eigenvector	Betweenness
a	6	12	0.299	0.167
b	9	9	0.379	8.933
C	1	17	0.054	0.000
d	8	10	0.372	0.933
e	7	11	0.336	0.567
f	7	11	0.336	0.567
g	6	12	0.299	0.167
h	6	12	0.293	0.367
i	8	10	0.372	0.933
j	6	12	0.293	0.367

Notes: The panels explain how director networks are mathematically recorded and calculated. Panel A is an overview of the example network. Panel B shows the basic centrality measures calculated for this example network.

Source: Renneboog and Zhao (2011).

directors in company 3 and four directors in company 5. Note that as degree counts the v vaffected by factors influencing board size.

The *closeness* of a vertex is defined as the sum of geodesic distances between this vertex and all other vertices that can be reached. Higher closeness value in fact suggests the vertex is further from other vertices. Thus this definition of closeness is also referred to

as "farness" by some scholars. Another way to define closeness, which is more commonly used in the research, is to calculate the inverse of the sum of all geodesic paths from the focal vertex to any other vertex. Compared to the previous definition, the high closeness value here means a shorter distance to all other vertices, which suggests the target vertex is more central in the network.

The *eigenvector centrality* of a vertex equals the sum of all adjacent vertices' eigenvector centrality scores. This calculation process begins with assigning a random score to all the vertices. At each iteration, the score of vertex *v* is calculated as the sum of all adjacent vertices' scores received in the previous iteration multiplied by a constant. This process is repeated for a sufficient number of times until the eigenvector centrality for each vertex is stable. The advantage of eigenvector centrality over other centrality measures is that it does not only capture how many vertices are linked to the target vertex (as degree centrality does), but also includes the centrality of those adjacent vertices (the degree of these linked vertices). Hence, a vertex will have a higher eigenvector centrality score if it is connected to more vertices with higher centrality scores.

The *betweenness* of a vertex is defined as the sum of its betweenness ratios. The betweenness ratio is the number of geodesic paths from any other two vertices (say *s* and *t*) passing through the focal vertex, divided by the number of all geodesic paths between *s* and *t*. In the above example, no geodesic path needs to pass director *c*, therefore his betweenness score is zero. Director *b* has a high betweenness score, because *b* is the only director connected to *c*. Thus, geodesic paths between director *c* and all the other directors need to pass director *b*, which leads to the high betweenness score of director *b*.

The resulting centrality measures for all directors in the above example can be seen in Panel B below.

Degree and eigenvector centrality measures focus on direct connections to adjacent vertices only. Closeness and betweenness analyze the distance between the target vertex and all other vertices (closeness) or the position of the target vertex on other geodesic paths (betweenness). Therefore, we categorize degree and eigenvector centrality measures as direct measures. Closeness and betweenness are regarded as indirect measures. Networks designed to accumulate managerial influence and information collection ability can be measured by different types of centrality measures. A CEO with many external directorships which contribute to his reputation and fame among the connected companies may be more influential. Such influence is captured by the direct measures. Valuable information can spread through the connections in the network and reach directors depending on network structure. A higher closeness score implies a shorter distance to other vertices, in which case the CEO is able to acquire the information earlier. A CEO's high betweenness score implies that he may be standing on the "brokerage position" between some otherwise separated groups. Such a position enhances the probability that a CEO receives new information earlier. Hence, centrality measures capturing indirect links (closeness and betweenness) are used to measure the access to information through networks. One may argue that direct connections bring in information as well. This is true, but direct centrality measures are inferior to indirect ones in terms of quantifying information collection efficiency. For instance, directors

with numerous direct connections in an isolated corner of the whole network can hardly receive information as quickly as directors in the center of the network (even with fewer direct connections). Moreover, as suggested by Granovetter (1973), information from direct connections is likely to be of lower quality than that from distant connections, because directly connected individuals tend to have redundant (similar) information sources. Therefore, the indirect centrality measures are better proxies of the information collection efficiency of the CEO's director network.

Renneboog and Zhao (2011) examine the relation between directors' networks, CEO compensation, and pay-for-performance. They distinguish between two functions of networks: the accumulation of managerial influence and the collection of valuable information and resources. The former implies that powerful CEOs may take advantage of their position to extract high benefits such as compensation at a cost to the shareholders. The latter function is beneficial to the company (and the director). The existing literature does not allow for this difference, but they make this distinction by employing network centrality measures at the direct and indirect levels. Strong direct networks (measured by degree and eigenvector centrality) proxy for managerial influence, whereas strong indirect networks (measured by closeness and betweenness) proxy for the information-collection value. Renneboog and Zhao (2011) find that both strong direct and indirect networks are rewarded by higher compensation (fixed salary, bonus, and equity-based compensation) and that pay-for-performance sensitivity decreases in the direct centrality measure. The combination of high CEO compensation and low pay-for-performance corroborates the managerial influence hypothesis. While the information value of indirect networks is reflected in higher CEO compensation, this function of networks does not influence the pay-for-performance relation.

Director Networks from Non-professional Origins

Directors do not only have networks through their executive and non-executive positions on corporate boards (*professional networks*), but also develop networks that originate from shared high school, college, or university education, elite or sports club memberships, or other social occasions (*social networks*). Kirchmaier and Kollo (2007) and Hwang and Kim (2009) demonstrate that the larger a director's social network, the higher is his compensation. Engelberg et al. (2009) and Brown et al. (2009) discover that past connections are also important components in the CEO networks and also have a positive impact on the size of executive compensation. Furthermore, the authors discuss the social connections' negative impact on pay-for-performance sensitivity and turnover-for-performance sensitivity. Lastly, Kirchmaier and Stathopoulos (2008) find that a CEO's social networks hamper firm performance.

In most of the existing literature on networks, only one type of network is analyzed (usually the professional network), which jeopardizes the integrity of the measurement of director networks and affects the accuracy of centrality measures. In order to solve this problem, one needs to consider director networks from different origins simultaneously. The current professional connections form the *primary network*. Connections from all other origins (including past professional networks) form *secondary networks*. The aggregation of all such types of networks is referred to as the *hybrid network* of a director. Secondary networks can enhance or supplement the primary one. For example, managers with the same education background (a degree from the same school) may be more closely related than otherwise. Secondary networks can also establish links between people not connected through primary networks. For example, directors working for different companies can still be friends with each other thanks to their common club membership.

Renneboog and Zhao (2010b) study the hybrid director network and its impact on CEO compensation. They hypothesize that the directors' primary networks (current professional connections) are "enhanced" by secondary networks based on past director connections, educational connections, and connections based on nationality. Their results confirm that director networks enhanced by means of past, educational, and nationality relations are positively correlated with a CEO's total remuneration while controlling for many other explanations, including corporate performance and ownership concentration.

Corporate Networks and Other Corporate Governance Issues

Besides CEO compensation and turnover, other corporate governance issues may be related to director networks. Renneboog and Zhao (2010a) study the CEO labor market and director networks. Their results show that a CEO's direct networks (capturing managerial power) shield him from dismissal when performance drops; CEOs' information collection networks improve their chances of departing from their current position.

M&As may be based on decisions influenced by networks as connections facilitate strategic information transmission between companies. When an executive director holds a non-executive position in another firm, more information about the latter company (e.g. its suitability as a takeover target) may flow to the former firm. Ishii and Xuan (2010) find evidence that connected CEOs have a larger chance of being rewarded with a larger bonus for completing an M&A transaction. They also demonstrate that abnormal stock returns are lower and that more target firm directors are retained in the combined company if the target and the acquirer were connected through their directors prior to the M&A.

CEO and director insider trading may result from lack of monitoring and/or leakage of price-sensitive information. Both factors may be induced by director networks.

Networks may yield directors better information access, which enables them to spot insider trading opportunities in the connected companies. Therefore, we expect that well-connected directors are more likely to trade on insider information.

Recently, the network of remuneration consultants has been studied. An interesting finding is that CEO compensation increases with the number of remuneration consultants hired by the company, ceteris paribus (Conyon et al., 2009 and Kabir and Minhat, 2010). When two companies are hiring the same remuneration consultant, they can be considered connected through the remuneration consultant's networks. Renneboog and Zhao (2011) find that companies are more generous with CEO compensation when the remuneration consultant networks they belong to are larger.

Conclusion and Future Research Agenda

In this chapter, we have shown the influence of director networks on corporate governance in the past and today. We have reviewed the development of director networks since the early 20th century and summarized the main regulatory changes. In order to get a better understanding of director networks, we have presented a survey of director network research and illustrated the most common and latest research on network measurement. Several studies point out that director networks have a significant impact on remuneration, turnover, and some other corporate governance issues. In remuneration-related studies, most researchers conclude that excessive director networks contribute to large and inefficient CEO compensation. Analysis with advanced network measures further reveals that CEOs use director networks to accumulate managerial power and acquire larger compensation without achieving better performance. In research on director networks and the managerial labor market, the results suggest that the managerial labor market is influenced by networks: directors with larger networks are more likely to find new positions. Lastly, the debate on whether director networks affect firm performance is still unclear. On one hand, director networks can be abused and can shift the balance of power in the boardroom to the CEO. On the other hand, director networks bring information and expertise into the company, which is particularly valuable when the firm is entering a new business or considering takeovers. To sum up, director networks research—a new research area in financial economics with continuously advancing techniques—has already generated many interesting results. This interdisciplinary research still has significant academic potential. We summarize a few topics for the future research agenda.

Methodology

The endogeneity problem in director network studies has not been solved. For instance, in the relationship between performance and networks the causality problem still remains: do networks lead to better performance or do networks merely reflect past

corporate performance (as reflected in the number of outside directorships a director subsequently accumulates)? More advanced econometric techniques and carefully chosen instrumental variables may contribute to the resolution of this problem.

Scope of Networks

Currently, in most studies only directors' professional connections are used to map networks. Yet professional connections are only one part of the true network. A more comprehensive network should also contain past (professional) connections as well as links based on common educational background, membership of social, elite, or sports clubs, nationality etc. Although the private nature of non-professional connections makes data collection on social networks difficult, some early attempts on social connections show promising results.

Network effects on corporate governance

The role of networks could still be studied further for some more aspects of corporate decision-making. For instance, M&A activity may be influenced by director networks. Also, cross-country studies on director network effects should also become more prominent because director networks are shaped by local regulation and local culture. Thus director networks are likely to differ in their structures and impacts across countries.

Notes

1. For instance, in the US, the Council of Institutional Investors proposes that full-time directors should have no more than two other directorships. In the UK, full-time executive directors should not have directorships in other FTSE 100 companies.

References

Aaronovitch, S. (1961). *The Ruling Class: A Study of British Finance Capital*. London: Lawrence and Wishart.

Agrawal, A., and Knoeber, C. (2001). "Do Some Outside Directors Play a Political Role?" *Journal of Law and Economics*, 44(1): 179–98.

Barnea, A., and Guedj, I. (2009). "Director Networks, EFA 2007," Ljubljana Meetings Paper, University of Texas at Austin.

Baruch, F. (1962). *Grote Macht in een Klein Land. Een Beeld van het Monopoliekapitaalen zijn Invloed in Nederland.* Amsterdam: Pegasus.

Baysinger, B., and Butler, H. (1985). "Corporate Governance and the Board of Directors: Performance Effects of Changes in Board Composition," *Journal of Law and Economics and Organization*, 1: 101–24.

Beesley, M. (1951). "Concentration in Midland Metal Industries," Ph.D. thesis, Birmingham University.

Brandeis, L. D. (1913). *Other People's Money and How the Bankers Use It*. New York: Frederick A. Stokes.

Brown, R., Lee, N., Gao, E., and Stathopoulos, K. (2009). "What Are Friends For?" CEO Networks, Pay and Corporate Governance, Working Paper, The University of Melbourne.

Burris, V. (1987). "The Political Partisanship of American Business: A Study of Political Action Committees," *American Sociology Review*, 52: 732–44.

Burt, R. (1983). *Corporate Profits and Cooptation: Networks of Market Constraints and Directorate Ties in the American Economy*. New York: Academic Press.

Carpenter, M. A., and Westphal, J. D. (2001). "The Strategic Context of External Network Ties: Examining the Impact of Director Appointments on Board Involvement in Strategic Decision Making," *Academy of Management Journal*, 44(4): 639–60.

Carrington, P. (1981). "Horizontal Co-optation through Corporate Interlocks," Ph.D. thesis, Department of Sociology, University of Toronto.

Cochran, P., Wood R., and Jones, T. (1985). "The Composition of Boards of Directors and Incidence of Golden Parachutes," *Academy of Management Journal*, 28: 664–71.

Conyon, M., Peck, S., and Sadler, G. (2009). "Compensation Consultants and Executive Pay: Evidence from the United States and the United Kingdom," *The Academy of Management Perspectives*, 23: 34–55.

Core, J., Holthausen, R., and Larcker, D. (1999). "Corporate Governance, Chief Executive Officer Compensation and Firm Performance," *Journal of Financial Economics*, 51: 371–406.

Crespi-Cladera, R., and Pascual-Fuster, B. (2008). "Executive Directors' Pay and Networks in Spanish Listed Companies," Working Paper, Universitat Illes Balears.

D'Aveni, R., and Kesner, I. (1993). "Top Managerial Prestige, Power, and Tender Offer Response: A Study of Elite Social Networks and Target Firm Cooperation during Takeovers," *Organization Science*, 4(2): 123–51.

Dalzell, R. (1987). *Enterprising Elite: The Boston Associates and the World they Made*. Cambridge, MA: Harvard University Press.

Davis, G. (1991). "Agents without Principles? The Spread of the Poison Pill through the Intercorporate Network," *Administrative Science Quarterly*, 36: 583–613.

—— (1994). "The Interlock Network as a Self-reproducing Social Structure," Unpublished manuscript, Kellogg Graduate School, Northwestern University.

—— and Stout, S. (1992). "Organization Theory and the Market for Corporate Control, 1980–1990," *Administrative Science Quarterly*, 37: 605–33.

—— Yoo, M., and Baker, W. (2003). "The Small World of the American Corporate Elite, 1982–2001," *Strategic Organization*, 1: 301–26.

Devos, E., Prevost, A., and Puthenpurackal, J. (2006). "Are Interlocked Directors Effective Monitors?" Working Paper, University of Texas at El Paso.

Domhoff, G. (2006). *Who Rules America? Power, Politics, and Social Change*, 5th edition. New York: McGraw-Hill.

Dooley, P. (1969). "The Interlocking Directorate," *The American Economic Review*, 59: 314–23.

Engelberg, J., Gao, P., and Parsons, C. (2009). "The Value of a Rolodex: CEO Pay and Personal Networks," Working Paper, University of North Carolina.

Fennema, M., and Schijf, H. (1978). "Analyzing Interlocking Directorates: Theory and Methods," *Social Networks*, l: 297–332.

Fich, E., and Shivdasani, A. (2006). "Are Busy Boards Effective Monitors?" *The Journal of Finance*, 61: 689–724.

——— and White, L. J. (2003). "CEO Compensation and Turnover: The Effect of Mutually Interlocked Boards," *Wake Forest Law Review*, 38: 935–59.

Fligstein, N., and Markowitz, L. (1993). "Financial Reorganization of American Corporations in the 1980s," in W. J. Wilson (ed.), *Sociology and the Public Agenda*. Beverly Hills, CA: Sage, 185–206.

Granovetter, M. (1973). "The Strength of Weak Ties," *American Journal of Sociology*, 78(6): 1360–80.

Gutierrez, L., and Pombo, C. (2010). "Outside Directors, Board Interlocks and Firm Performance: Empirical Evidence from Colombian Business Groups," Working Paper, Universidad del Rosario.

Hallock, K. (1997). "Reciprocal Interlocking Boards of Directors and Executive Compensation," *Journal of Financial and Quantitative Analysis*, 32: 331–44.

Haunschild, P. (1993). "Interorganizational Imitation: the Impact of Interlocks on Corporate Acquisition Activity," *Administrative Science Quarterly*, 38: 564–92.

Heinze, T. (2002). "Die Struktur der Personalverflechtung Großer Deutscher Aktiengesellschaften Zwischen 1989 und 2001," *Zeitschrift für Soziologie*, 31(5): 391–410.

Henderson, D. (2010). *Big Oil and their Bankers in the Persian Gulf: Four Horsemen, Eight Families and their Global Intelligence, Narcotics and Terror Network*. CreateSpace.

Higgs, D. (2003). *Review of the Role and Effectiveness of Non-Executive Directors*. London: Department of Trade and Industry/HMSO.

Hochberg, Y., Ljungqvist, A., and Lu, Y. (2007). "Whom You Know Matters: Venture Capital Networks and Investment Performance," *The Journal of Finance,* 62: 251–301.

Hwang, B., and Kim, S. (2009). "It Pays to Have Friends," *Journal of Financial Economics*, 93: 138–58.

Ishii, J., and Xuan, Y. (2010). "Acquirer-Target Social Ties and Merger Outcomes," Working Paper, Stanford Graduate School of Business.

Jeidels, O. (1905). Grossbanken zur Industrie mit besonderer Berücksichtigung der Eisenindustrie. Liepzig: Duncker & Humblot.

Kabir, R., and Minhat, M. (2010). "Multiple Compensation Consultants and CEO Pay," Working Paper, University of Twente.

Khanna, T., and Thomas, C. (2009). "Synchronicity and Firm Interlocks in an Emerging Market," *Journal of Financial Economics*, 92(2): 182–204.

Kiel, G. C., and Nicholson, G. J. (2006). "Multiple Directorships and Corporate Performance in Australian Listed Companies," *Corporate Governance: An International Review*, 14(6): 530–46.

Kirchmaier, T., and Kollo, M. (2007). "The Role of Prestige and Networks in Outside Director Appointments," Working Paper, University of Manchester.

——— and Stathopoulos, K. (2008). "From Fiction to Fact: The Impact of CEO Social Networks," FMG Discussion Papers, Financial Markets Group.

Koenig, T. (1979). "Interlocking Directorates among the Largest American Corporations and their Significance for Corporate Political Activity," Ph.D. thesis, University of California.

Kramarz, F., and Thesmar, D. (2006). "Social Networks in the Boardroom," IZA Discussion Paper No. 1940.

Krantz, M. (2002). "Web of Board Members Ties Together Corporate America," *USA Today*.

Kuhnen, C. (2006). "Business Networks, Corporate Governance and Contracting in the Mutual Fund Industry," *Journal of Finance*, 64(5): 2185–220.

Lang, J., and Lockhart, D. (1990). "Increased Environmental Uncertainty and Changes in Board of Director Linkage Patterns: The U.S. Trunk Airlines during Deregulation," *Academy of Management Journal*, 33: 106–28.

Larcker, D., Richardson, S., Seary, A., and Tuna, I. (2006). "Back Door between Directors and Executive Compensation," Working Paper, The Wharton School, University of Pennsylvania.

Liu, Y. (2008). "CEO Network and CEO Turnover," Working Paper, University of Maryland.

Meeusen, W., and Cuyvers, L. (1985). "The Interaction between Interlocking Directorships and the Economic Behaviour of Companies," in F. N. Stokman, R. Ziegler, and J. Scott (eds.), *Networks of Corporate Power: A Comparative Analysis of Ten Countries*. Oxford: Polity Press.

Mizruchi, M. (1982). *The American Corporate Network 1904–1974*. Beverly Hills, CA: Sage.

—— (1996). "What Do Interlocks Do? An Analysis, Critique, and Assessment of Research on Interlocking Directorates," *Annual Review of Sociology*, 22: 271–98.

—— and Koenig, T. (1986). "Economic Sources of Corporate Political Consensus: An Examination of Inter-industry Relations," *American Sociology Review*, 5: 482–91.

Myint, Y., Vyakarnam, S., and New, M. (2005). "The Effect of Social Capital in New Venture Creation: the Cambridge High-Technology Cluster," *Strategic Change*, 14: 165–77.

Ong, C., Wan, D., and Ong, K. (2003). "An Exploratory Study on Interlocking Directorates in Listed Firms in Singapore," *Corporate Governance: An International Review*, 11(4): 322–34.

Palmer, D., Barber, B., Zhou, X., and Soyal, Y. (1995). "The Friendly and Predatory Acquisition of Large U.S. Corporations in the 1960s: The Other Contested Terrain," *American Sociology Review*, 60: 469–99.

Prinz, E. (2006). "Corporate Governance and the Uncertain Role of Interlocking Directorates: Director Networks in Germany and their Impact on Financial Performance," Working Paper 1061001, Université de Bourgogne–LEG/Fargo (Research Center in Finance, Organizational Architecture and Governance).

Ratcliff, R. (1980). "Banks and Corporate Lending: An Analysis of the Impact of the Internal Structure of the Capitalist Class on the Lending Behavior of Banks," *American Sociological Review*, 45: 553–70.

Renneboog, L., and Zhao, Y. (2010a). "CEO Turnover, Succession and Director Networks," Working Paper, Tilburg University.

—— —— (2010b). "The Role of Directors' Professional and Social Networks," Working Paper, Tilburg University.

—— —— (2011). "Us Knows Us in the UK: On Director Networks and CEO Compensation," *Journal of Corporate Finance*, 17(4): 1132–57.

Richardson, R. (1987). "Directorship Interlocks and Corporate Profitability," *Administrative Science Quarterly*, 32: 367–86.

Santella, P., Drago, C., Polo, A., and Gagliardi, E. (2008). "A Comparison of the Director Networks of the Main Listed Companies in France, Germany, Italy, the United Kingdom, and the United States," Working Paper, Bank of Italy.

Santos, R., Da Silveira, A., and Barros, L. (2009). "Board Interlocking in Brazil: Directors' Participation in Multiple Companies and its Effect on Firm Value," Working Paper, University of São Paulo.

Scott, W. (1992). *Organizations: Rational, Natural, and Open Systems*. Englewood Cliff, NY: Prentice-Hall.

Shaw, G., and Alexander, A. (2006). "Interlocking Directorates and the Knowledge Transfer of Supermarket Retail Techniques from North America to Britain," *The International Review of Retail, Distribution and Consumer Research*, 16: 375–94.

Singh, H., and Harianto, I. (1989). "Management-Board Relationships, Takeover Risk, and the Adoption of Golden Parachutes," *Academy of Management Journal*, 32(1): 327–24.

Stearns, L., and Mizruchi, M. (1993a). "Corporate Financing: Economic and Social Aspects," in R. Swedberg (ed.), *Explorations in Economic Sociology*. New York: Russell Sage, 279–307.

——— ——— (1993b). "Board Composition & Corporate Financing: The Impact of Financial Institution Representation on Borrowing," *Academy of Management Journal*, 36: 603–18.

Stokman, F., Van der Knoop, J., and Wasseur, F. (1988). "Interlocks in the Netherlands: Stability and Careers in the Period 1960–1980," *Social Networks*, 10: 183–208.

Subrahmanyam, A. (2008). "Social Networks and Corporate Governance," *European Financial Management*, 14(4): 633–62.

US House of Representatives (1965). "Report on Interlocks in Corporate Management," Staff of the Antitrust Subcommittee of the House of Commerce on the Judiciary, 89th Congress.

Wade, J., O'Reilly, C. A. III, and Chandratat, I. (1990). "Golden Parachutes: CEOs and the Exercise of Social Influence," *Administrative Science Quarterly*, 35: 587–603.

Westphal, J. D., and Zajac, E. (1996). "Director Reputation, CEO/Board Power, and the Dynamics of Board Interlocks," *Administrative Science Quarterly*, 41(3): 507–29.

Zajac, E. (1988). "Interlocking Directorates as an Inter-organizational Strategy," *Academy of Management Journal*, 31: 428–38.